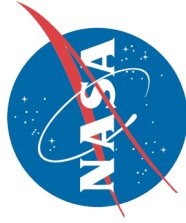


# **NASA Dryden Status**

**Aerospace Control & Guidance Sub-committee  
Boulder, CO  
February 2007**

**John Bosworth  
(661) 276-3792  
[John.bosworth@nasa.gov](mailto:John.bosworth@nasa.gov)**



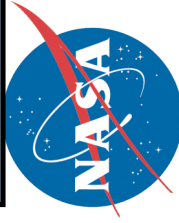
**February 2007**

# Autonomous Airborne Refueling Demonstration (AARD)

- Sierra-Nevada Corp. working more robust algorithms with 2 of 3 successful with 100% miss recognition
- Took fuel with autonomous disconnect
- Successfully demonstrated plugging with rendezvous
  - 2 mi dist, 60 deg off centerline
- Soon will demonstrate refueling in a turn



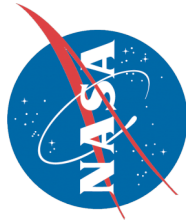
- Autonomous probe and drogue airborne refueling
- F/A-18 configured as autonomous testbed
- Pallet on tanker, otherwise unmodified
- Relative GPS/INS navigation
- Monocular camera tracking system



February 2007

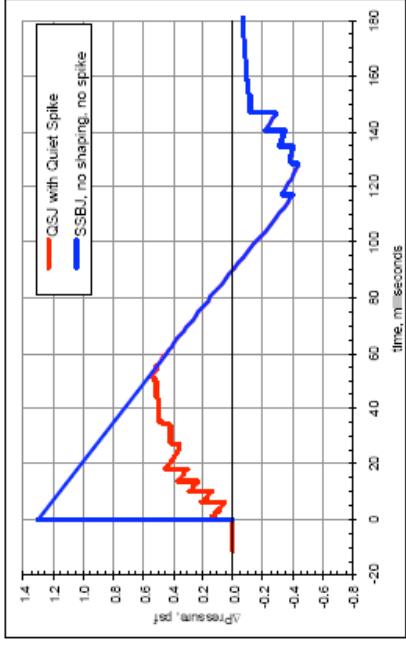
# Ikhana Project Update

- Flying 3-4 flights per day for pilot training at Grey Butte Fire Mission this summer
  - Ames
  - USFS
- ARTS III research controller hardware is ready. Software is being developed
  - Combined aircraft and payload commands
  - Sensor fusion (IVHM)
  - Intelligent mission management
- GA is developing software to accept “ground station” commands from the on-board ARTS III research controller
  - Mission plans
  - Autopilot hold commands
  - Stick, Rudder and throttle commands



February 2007

# Quiet Spike



AIAA 2005-1015

- Joint program with NASA & Gulfstream



- Flight Test Completed
  - No SML extended or retracted (despite ground test predictions)
  - Envelope cleared to M 1.8
    - ✧ Small effects on stability, CAS on
    - ✧ Damping derivatives reduced

significantly

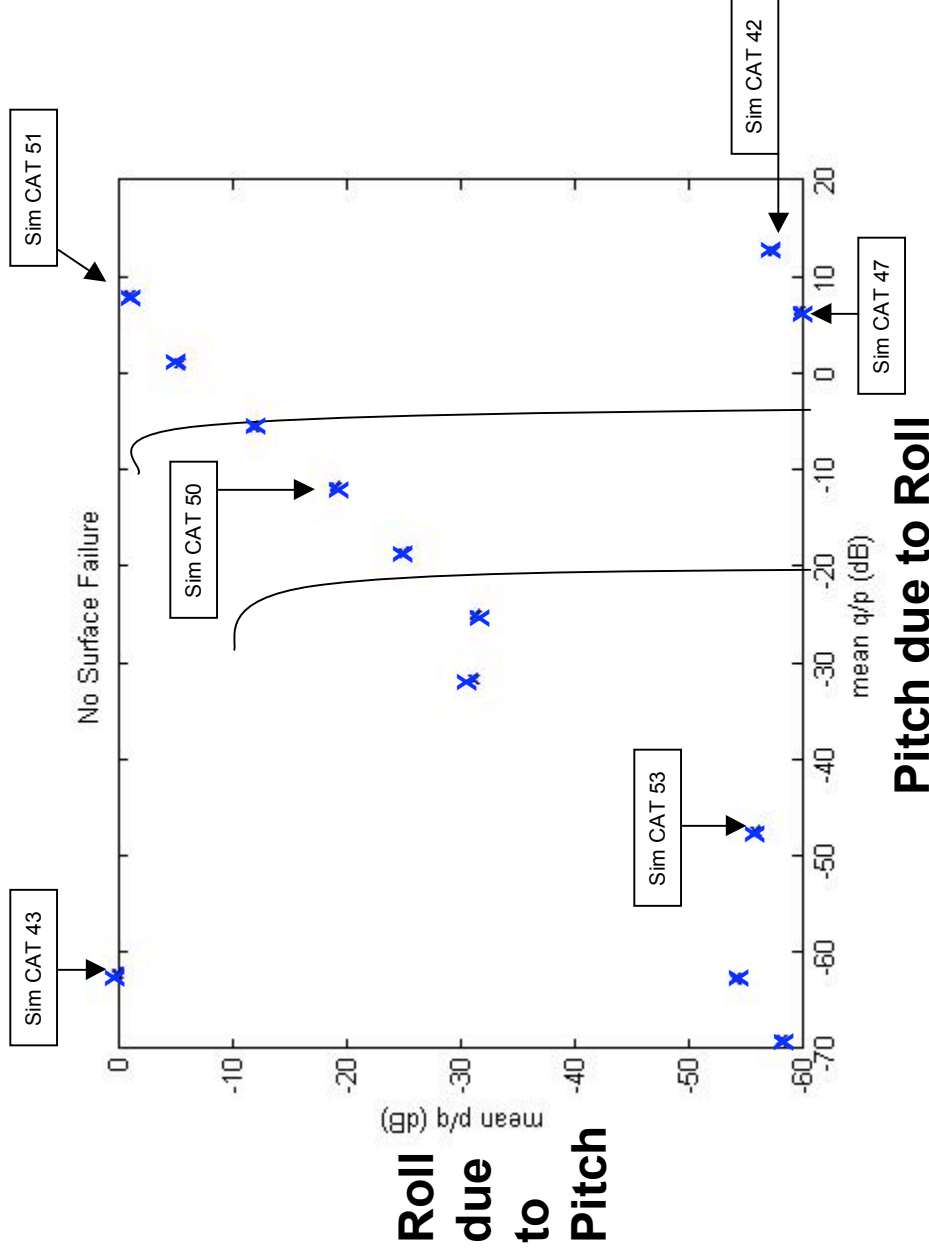
- Cm<sub>q</sub> near zero at M 1.8
- Marginally acceptable CAS Off HQ predicted



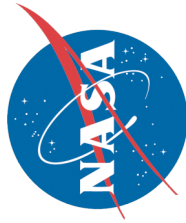


# F-15 Intelligent Flight Control System

- Completed space-based range testing
- Completed Quiet Spike probing flights
- Returning to IFCS flights in March
  - Larger canard multipliers
  - HQ metrics for asymmetries
- Working improved direct adaptive neural network



Coupling Metric Developed for Rotocraft

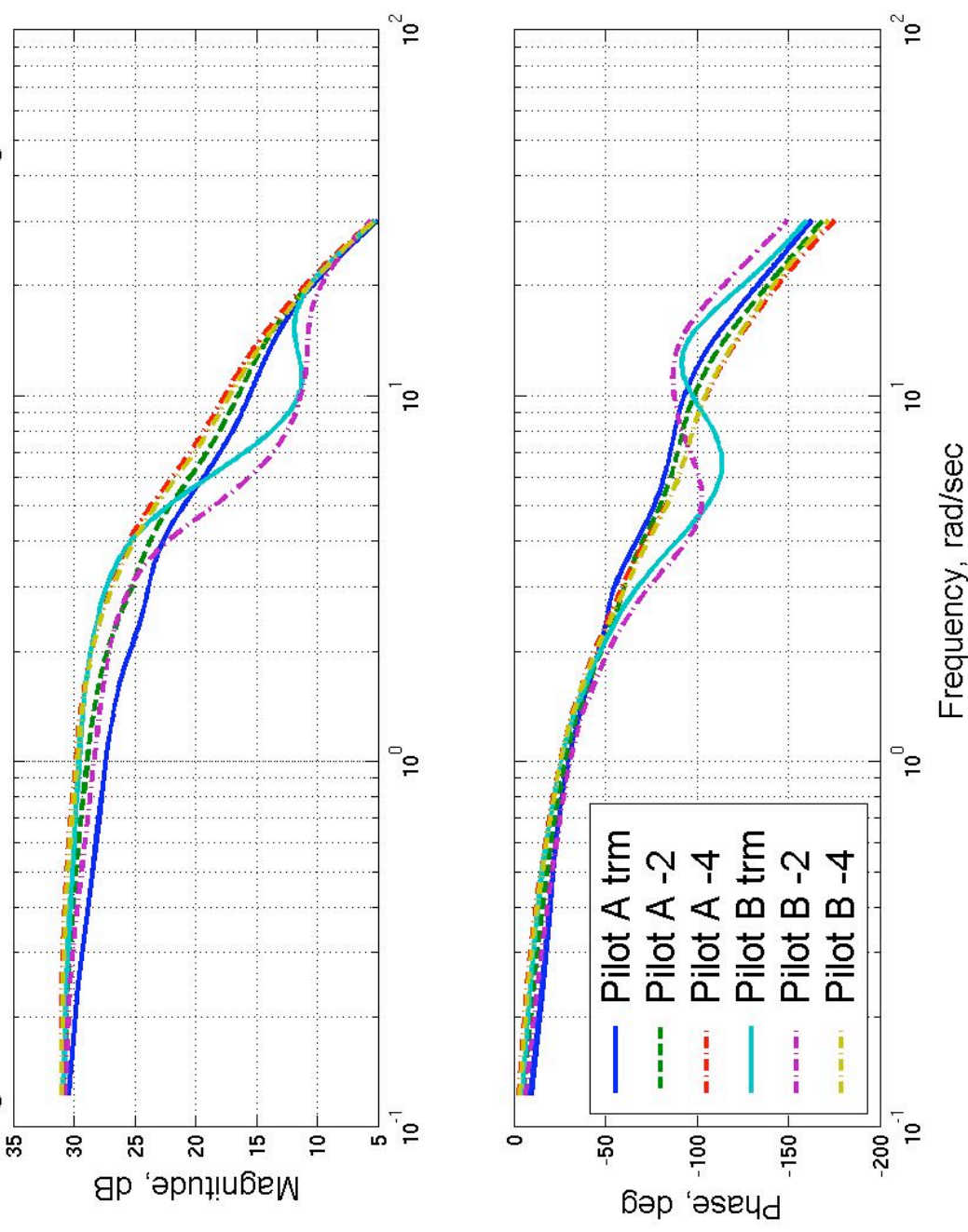


February 2007

# F-15 Intelligent Flight Control System

- Investigating PIO tendency
- Driven by roll-to-pitch weight
- Errors due to PIO not large enough to move roll weights
- Trade off between dead zone and sensitivity

Figure ROLLRSP Roll Rate due to Roll Stick Formation Flight Task



February 2007

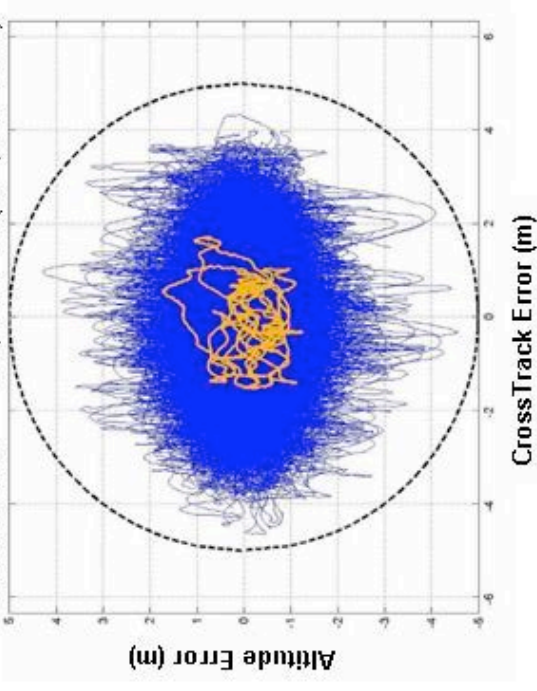
# C-20A Precision Autopilot Development

## Unmanned Aerial Vehicle Synthetic Aperture Radar (UAVSAR)

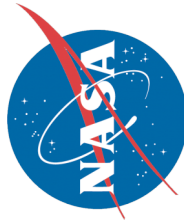
- Goal: Fly for up to 200 km within a 10 meter tube with light turbulence
- Status
  - Flight Readiness Review Board briefed December 2006
  - Formal Software Qualification completed February 2007
  - Precision Autopilot Demonstration flight early 2007



Mach 0.8 – 40,000 ft (12,192 m.)



## Monte Carlo Simulation Results



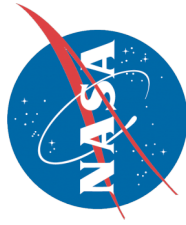
February 2007

# X-48 Blended Wing Body

- Low speed taxi tests completed in Dec 2006
- Verification and validation of flight software is 75% complete
- Flight readiness review scheduled for mid Mar 2007



- Potential testbed for future ARMD work



February 2007



